

# Primary-Side-Control CC/CV Controller

## FEATURES

- Constant-Current (CC) and Constant-Voltage (CV) Control with Primary Side Control
- $\pm 5\%$  Constant Voltage Regulation  
 $\pm 10\%$  Constant Current Regulation
- Eliminates Opto-Coupler and TL431
- External Power NPN Transistor for Low Cost
- Built-in Line Compensation
- Charger Status Indicator in Primary Side
- Cycle-by-Cycle Current Limiting
- Over Voltage Protection (OVP)
- Over Temperature Protection (OTP)
- Open Circuit Protection
- Short Circuit Protection
- Pb-Free Device

## TYPICAL APPLICATION

- Adapter/Charger for Cell/Cordless Phones, PDAs, MP3 and Other Portable Apparatus
- Standby and Auxiliary Power Supplies Set Top Boxes (STB)

## DESCRIPTION

The FT832DB controller device is optimized for high-performance, Indicate charger status switching mode charger applications. The FT832DB integrated

The charger status indicator in primary side, no need any devices for indicating the charger status in secondary side. The indicator integrated in FT832DB can be adjustable by a resistor between the pin Cable and gnd .FT832DB facilitates CC/CV charger design by eliminating an opto-coupler and TL431. Its highly integrated functions such as Under Voltage Lockout (UVLO), Leading Edge Blanking (LEB), Built-in Line Compensation, External Power NPN Transistor offer the users a high efficiency and low cost solution for charger applications.

Furthermore, FT832DB features fruitful protections like OTP (Over Temperature Protection), OVP (Over Voltage Protection), and Open Circuit Protection, Short Circuit Protection to eliminate the external protection circuits and provide reliable operation. FT832DB is available in SOP8 packages.

**TYPICAL APPLICATION CIRCUIT**

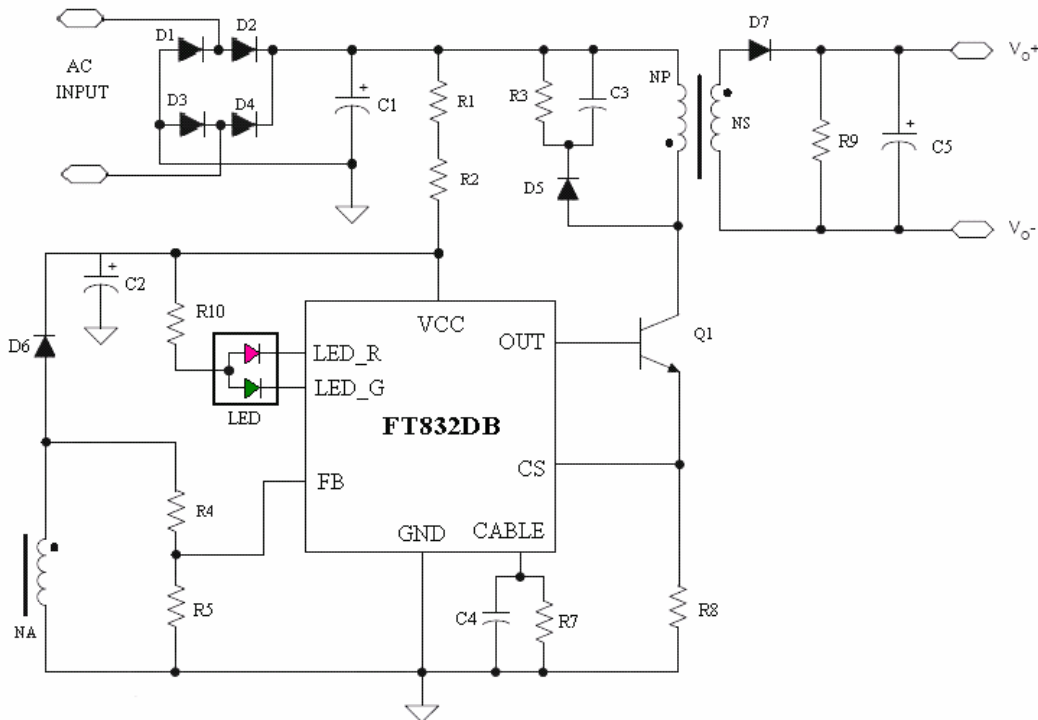


Figure 1: Typical Application Circuit

**ABSOLUTE MAXIMUM RATINGS**

FB to GND.....	-0.3V to +9V
CS to GND.....	-0.3V to +9V
VCC to GND.....	-0.3V to +18V
OUT to GND.....	-0.3V to +9V
LED_R to GND.....	-0.3V to +18V
LED_G to GND.....	-0.3V to +18V
CABLE to GND.....	-0.3V to +9V
Operating Temperature Range.....	-40°C to +125°C
Junction Temperature.....	-40°C to +150°C
Storage Temperature Range .....	-60°C to +150°C
ESD Protection HBM.....	2000V
MM.....	500V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**PIN CONFIGURATION**

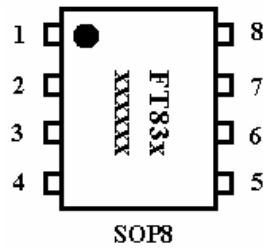


Figure 2: Pin Assignments

Pat No.	Package	Pin Definition							
		1	2	3	4	5	6	7	8
FT832DB	SOP8	LED_G	LED_R	VCC	OUT	GND	FB	CS	CABLE

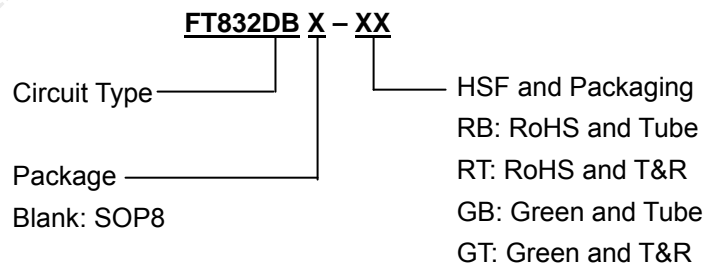
Table 2: Pin Definition

**TERMINAL DEFINITION**

Pin	Description
<b>GND</b>	Ground.
<b>FB</b>	Output voltage feedback pin
<b>CS</b>	Primary current sense
<b>VCC</b>	Supply voltage
<b>OUT</b>	NPN switch base driver
<b>LED_R</b>	Connect to red LED for indicating charging state
<b>LED_G</b>	Connect to green LED for indicating charge completed state
<b>CABLE</b>	Adjust cable compensation by an external resistor and capacitor to GND

Table 3

**ORDERING INFORMATION**



Package	Temperature Range	HSF	Packaging	Ordering Code
SOP8	-40°C-125°C	RoHS	Tube	FT832DB-RB
			Tape and Reel	FT832DB-RT
		Green	Tube	FT832DB-GB
			Tape and Reel	FT832DB-GT

Table 4

**MARKING RULE**

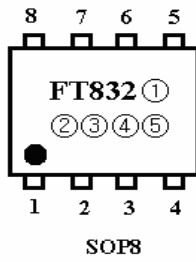


Figure 3: Marking Rule

SOP8:

- ①: Represents Version (DB)
- ②③④⑤: for internal reference

**BLOCK DIAGRAM**

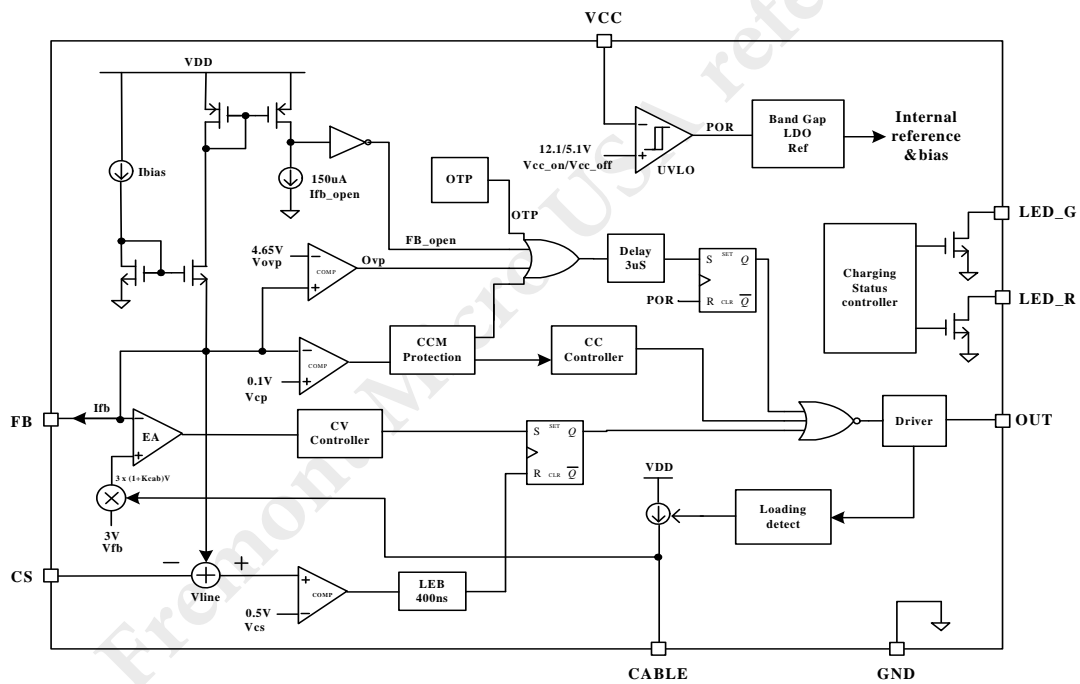


Figure 4: FT832DB Block Diagram

## ELECTRICAL CHARACTERISTICS

(For typical values  $T_J=25^{\circ}\text{C}$ ,  $V_{CC}=14\text{V}$ , unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>Current Sense</b>					
Maximum Current Threshold	Vcs_max	0.49	0.5	0.51	V
Pre-drive Current Threshold	Vcs_pre	0.44	0.45	0.46	V
Vcs_limit Temperature Stability ( $-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$ )			1		%
Leading Edge Blanking Duration	Tleb		400		ns
Propagation Delay (OUT=1.0nF to GND)	Tpd			200	ns
<b>Feedback Section</b>					
Feedback Voltage Threshold	Vfb	2.97	3	3.03	V
FB Pin minimum current	Ifb_open		50		$\mu\text{A}$
OVP Protection Threshold Level	Vovp	4.55	4.65	4.75	V
CCM protection Threshold Level	Vcp		0.1		V
<b>Supply Section</b>					
Start Up Threshold Voltage	Vcc_on	13.5	15	17.2	V
Under Voltage Lockout Voltage	Vcc_off	4.8	5.4	6	V
VCC Start Up Current	Istart_up		6		$\mu\text{A}$
Operating Current	Iop		1.1		mA
<b>Protection Section</b>					
Feedback Loop Open Protection	Ifb_open		150		$\mu\text{A}$
Over Temperature Protection	Tsd		140		$^{\circ}\text{C}$
Over Voltage Protection	V_ovp		18.5		V
<b>Base Driver</b>					
Output Maximum Sink current	I <sub>sink</sub>	50			mA
Output Maximum Source current	I <sub>source</sub>		28		mA
<b>Compensation</b>					
Line Compensation (I <sub>fb</sub> =1mA)	V <sub>line</sub>		45		mV

Table 5

**ELECTRICAL CHARACTERISTICS (continues)**

Characteristic	Symbol	Min	Typ	Max	Unit
<b>LED Section</b>					
Threshold level of the red LED lighting turn to green LED lighting ( $Kcab2=8 \times 560 / R7^{*1} \times 10e+3$ )	$Kcab2^{*3}$		Kcab2		%
Threshold level of the green LED lighting turn to red LED lighting	$Kcab3^{*4}$		Kcab2+2		%
The Maximum Sink current for LED_R	Imr			10	mA
The Maximum Sink current for LED_G	Img			10	mA
The Leakage current for LED_R	lkr			1	uA
The Leakage current for LED_G	lkg			1	uA

**Table 5**

<sup>\*1</sup> (R7): Resistor connected between Pin CABLE and GND

<sup>\*3</sup> (Kcab2): the rate of the loading current when red led lighting turn to green and the maximum loading current .

<sup>\*4</sup> (Kcab3): the rate of the loading current when green led lighting turn to red and the maximum loading current .

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## FUNCTIONAL DESCRIPTION

### Operating Description

FT832DB are cost effective and high-performance AC-DC power supply controller for off-line low power AC-DC applications including battery chargers and adaptors. Without secondary feedback circuit, the constant voltage (CV) and constant current (CC) control can be achieved accurately.

### Start up Control

Start-up current of FT832DB is very low so that a start-up resistor with high resistance and low-wattage is allowed to supply the start-up power for the controller. The large value startup resistor can minimize the power loss in application and starts up quickly. A 1.5Mo, 0.25W start-up resistor and a 10uF/25V Vdd hold-up capacitor are sufficient for an AC-to DC power adapter.

### Operating current

The operating current of FT832DB is as low as 1mA. Good efficiency is achieved with the low operating current together with valley turn on of the external power NPN transistor. Low operating current also reduces the Vcc hold-up capacitance requirement.

### Constant voltage (CV) and constant current (CC) Operation

The FT832DB can accurately achieve CV/CC characteristic output without secondary side voltage and current-feedback circuits. It operates in CV mode to regulate the output voltage by capturing the auxiliary winding feedback voltage at FB pin. The auxiliary winding feedback voltage is proportional to secondary winding, so it provides controller the feedback signal from secondary side and achieves constant-voltage output. In CC mode, the controller detects the secondary discharger peak current and the discharger time, which determines the off-time of the base driver to make the output average current constant. In the CV or CC mode, the primary side peak current is constant if the Rcs is settled.

### Leading edge blanking

Each time the power NPN transistor is switched on, a turn-on spike occurs at the sense resistor. To avoid premature termination of the switching pulse, a 400ns leading edge blanking time is built in. Conventional RC filtering can therefore be omitted. During this blanking period, the current limit comparator is disabling and cannot switch off the base driver.

### Under voltage lockout (UVLO)

FT832DB turn-on [Vcc(on)] and turn-off [Vcc(off)] are 15V and 5.4V. During start-up, the hold-up capacitor must to be charged to 15V through the start-up resistor. The hold-up capacitor continues to supply Vcc until power can be delivered from the auxiliary winding of the transformer. Vcc must not drop below 5.4V during this start-up process. This UVLO hysteresis window ensures that hold-up capacitor is sufficient to supply Vcc during start-up.

### Protection control

With rich protection features of FT832DB, a good power supply system reliability is achieved. The protection features including cycle by cycle current limiting, Vcc over voltage protection and clamp,

short circuit protection, feedback loop open protection, over temperature protection and under voltage lockout on Vcc.

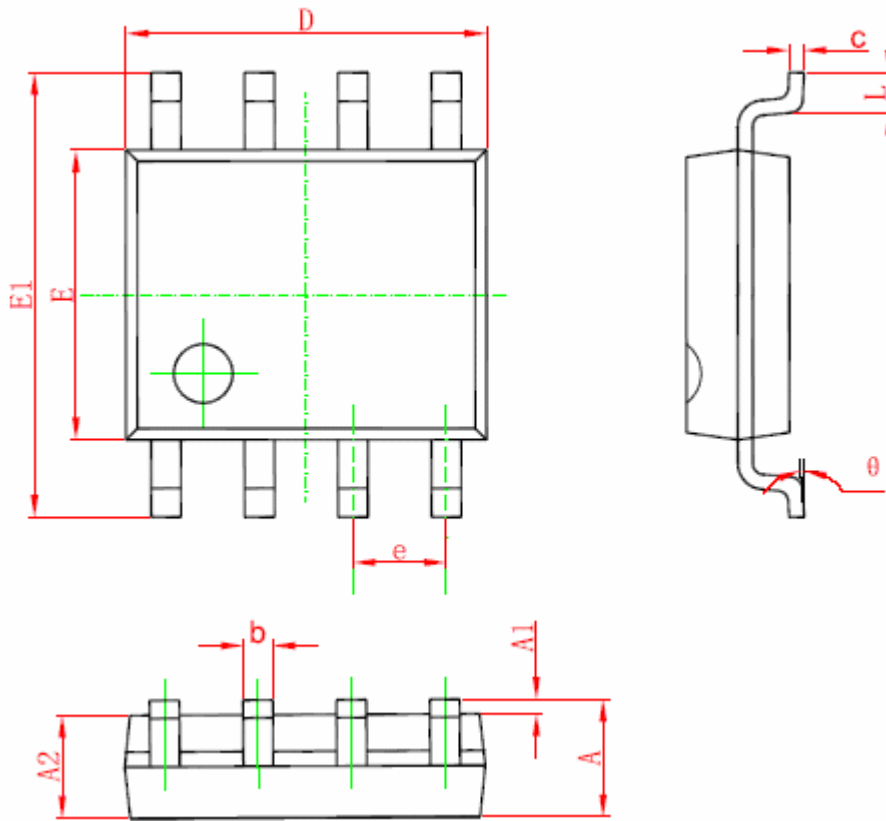
**LED Charge Indicator**

A proprietary LED charge indicator is integrated in FT832DB. In charger application, FT832DB can indicate the charge status by connecting red LED and green LED to LED\_R pin and LED\_G pin. The red LED indicates charging, the green LED light means the completion of charging.

For Fremont Micro USA reference only.



**SOP8 PACKAGE OUTLINE DIMENSIONS**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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